REMARKS

This Amendment is filed in response to the final Office Action dated December 9, 2009. For the following reasons this application should be allowed and the case passed to issue. No new matter is introduced by this Amendment. The amendment to claim 1 is supported by the specification at paragraph [0017]. The amendment to the specification corrects a misspelling.

Claims 1, 4-9, 16-22, and 25-27 are pending in this application. Claims 1, 4-9, 16-22, and 25-27 have been rejected. Claim 1 is amended in this response. Claims 2, 3, 10-15, 23, and 24 were previously canceled.

Claim Rejections Under 35 U.S.C. §§ 102/103

Claims 1, 4-6, 9, 16-22, and 25-27 were rejected under 35 U.S.C. § 102(b) as anticipated by, or in the alternative, as obvious over Delnick (US 5,948,464), as evidenced by Walls et al. (*Fumed Silica-Based Composite Polymer Electrolytes: Synthesis, Rheology, and Electrochemistry*). The Office Action found that Delnick discloses a separator comprising a silica filler and a polymer binder. The separator comprises indefinite-shape particles comprising shapes of dendrites, grape clusters, or coral. The Office Action found that Walls et al. disclose that fumed silica consists of fused silica particles. The Office Action further found that Delnick clearly teaches leaving the interstices open is a result effective variable.

Claims 1, 5, 16, 18, 26, and 27 were rejected under 35 U.S.C. § 102(b) as anticipated by, or in the alternative, as obvious over Gozdz (US 5,571,634), as evidenced by Walls et al. The Office Action found that Gozdz discloses a separator comprising fumed silica or fumed alumina and DBP binder. The Office Action further found that the fumed silica and fumed alumina would inherently have indefinite shapes with necks. The Office Action found that Walls et al. disclose that fumed silica consists of fused silica particles. Because Walls et al. teach, "[t]he

unique features of fumed silica are its branched, primary structure consisting of fused SiO2 particles," the Examiner remains unpersuaded that fumed silica is actually an agglomeration of spheroids, as taught by Day. Further, the Examiner could interpret Fig. 1 of Walls et al. as showing the agglomerated silica spheroids form a neck between single crystalline particles at either end of the branched structure.

These rejections are traversed, and reconsideration and withdrawal thereof respectfully requested. The following is a comparison between the present invention, as claimed, and the cited prior art.

Delnick and Gozdz do not anticipate or render obvious the claimed secondary batteries because the cited references do not disclose or suggest the porous electron-insulating layer has a porosity of 50% or more and the indefinite-shape particles maintain their shape when subjected to a shearing force to disperse the particles in a liquid component to form a slurry, as required by claim 1; and the porous electron-insulating layer has a porosity of 50% or more and the indefinite-shape particles are polycrystalline particles comprising a plurality of single crystalline particles that are diffusion bonded to each other, and a neck formed between at least a pair of the single crystalline particles, the neck comprising the same material as the single crystalline particles, as required by claim 16. Neither Delnick nor Gozdz disclose or suggest the claimed porosity. Please note that Gozdz discloses using 10-70% on a polymer basis of a finely-divided inorganic filler (col. 2:50-57). In Example 1, Gozdz uses 4 g of filler per 6 g of polymer. At such a high weight ratio of polymer to silica a porosity of 50% or more cannot be obtained. Further, the prior art fumed silica does not comprise a plurality of single crystalline particles that are diffusion bonded to each other, as required by claim 16. US Patent No. 6,084,767 to Day and US Patent No. 5,965,299 to Khan et al. provide support for Applicants' position. Fumed silica is

usually an agglomerate of spherical superfine particles produced when silane gas (SiH_4) is oxidized or silicon in a gaseous state is oxidized in an arc flame. Day discloses (column 2, lines 42-45) that fumed silica is an agglomeration of small spheroids of about 12 to 13 nanometers in diameter. In other words, fumed silica is an agglomerate of spherical fine particles and has **no neck** formed between a pair of single crystal particles. Furthermore, it is evident in Khan et al. (Figs. 2 and 3) that fumed silica is <u>not</u> in the form of dendritic polycrystalline particles having a neck formed between a pair of single crystal particles. For example, in Fig. 3 of Khan et al., the particles are agglomerated through cross-linking of the functional groups (C=C) on the surface of the particles instead of necks. In the case of cross-linking, even if a neck is formed, and there is no indication that a neck is formed, the neck would not be of the same material as the single crystalline particles. Furthermore, as explained on page 9 the response filed June 18, 2008, and page 7 of the response filed November 10, 2009, diffusion bonding has an art recognized definition:

> Diffusion bonding of materials in the solid state is a process for making a monolithic joint through the formation of bonds at atomic level, as a result of closure of the mating surfaces due to the local plastic deformation at elevated temperature which aids interdiffusion at the surface layers of the materials being joined.

Clearly the cited prior art does not disclose or suggest “diffusion bonded,” as required by claim 16.

The Examiner found, "Delnick clearly teaches leaving the interstices open is a result effective variable" (page 4 of Office Action). While one of ordinary skill in this art would recognize that open interstices are needed to allow electrolyte permeability, the necessity of interstices for allowing electrolyte permeability is not the same as the number of interstices required for significantly affecting large current behavior in a low temperature environment.

There is a difference between the number of interstices needed for normal battery reactions and for enabling a significant improvement in discharge characteristics at 0 °C and the 2C discharge rate. As shown in Tables 1 and 2 (paras. [0066] and [0080]), the discharge characteristics 0 °C and the 2C discharge rate significantly degrade at porosities below 50%.

The factual determination of lack of novelty under 35 U.S.C. § 102 requires the disclosure in a single reference of each element of a claimed invention. *Helifix Ltd. v. Blok-Lok Ltd.*, 208 F.3d 1339, 54 USPQ2d 1299 (Fed. Cir. 2000); *Electro Medical Systems S.A. v. Cooper Life Sciences, Inc.*, 34 F.3d 1048, 32 USPQ2d 1017 (Fed. Cir. 1994); *Hoover Group, Inc. v. Custom Metalcraft, Inc.*, 66 F.3d 399, 36 USPQ2d 1101 (Fed. Cir. 1995); *Minnesota Mining & Manufacturing Co. v. Johnson & Johnson Orthopaedics, Inc.*, 976 F.2d 1559, 24 USPQ2d 1321 (Fed. Cir. 1992); *Verdegaal Bros. v. Union Oil Co. of California*, 814 F.2d 628, 631, 2 USPQ2d 1051 (Fed. Cir. 1987). Because Delnick and Gozdz do <u>not</u> disclose the porous electron-insulating layer has a porosity of 50% or more and the indefinite-shape particles maintain their shape when subjected to a shearing force to disperse the particles in a liquid component to form a slurry, as required by claim 1; and the porous electron-insulating layer has a porosity of 50% or more and the indefinite-shape particles are polycrystalline particles comprising a plurality of single crystalline particles that are diffusion bonded to each other, and a neck formed between at least a pair of the single crystalline particles, the neck comprising the same material as the single crystalline particles, as required by claim 16, Delnick and Gozdz do not anticipate claims 1 and 16.

Claim 8 was rejected under 35 U.S.C. § 103(a) as obvious over Delnick. The Office Action considered it obvious that a lithium ion battery would comprise non-aqueous solvent and

a lithium salt. This rejection is traversed, and reconsideration and withdrawal thereof respectively requested.

Delnick does not suggest the claimed secondary battery because Delnick does not suggest the porous electron-insulating layer has a porosity of 50% or more and the indefinite-shape particles maintain their shape when subjected to a shearing force to disperse the particles in a liquid component to form a slurry, as required by claim 1.

Applicants further submit that Gozdz does not suggest the claimed secondary battery.

Claims 7 and 20 are rejected under 35 U.S.C. § 103(a) as obvious over Delnick in view of Waterhouse. The Office Action acknowledged that Delnick does not disclose the resin binder comprises a polyacrylic acid derivative. The Office Action relied on the Waterhouse teaching of acrylic acid as a binder in a separator to conclude that it would have been obvious to substitute acrylic acid as a binder into the separator of Delnick because the selection of a known material based on the suitability for its intended use is obvious. This rejection is traversed, and reconsideration and withdrawal thereof respectfully requested.

Delnick, Walls et al., and Waterhouse, whether taken in combination, or taken alone, do not render obvious the claimed secondary batteries because Waterhouse does not cure the deficiencies of Delnick and Walls et al. Waterhouse does not disclose or suggest the porous electron-insulating layer has a porosity of 50% or more and the indefinite-shape particles maintain their shape when subjected to a shearing force to disperse the particles in a liquid component to form a slurry, as required by claim 1; and the porous electron-insulating layer has a porosity of 50% or more and the indefinite-shape particles are polycrystalline particles comprising a plurality of single crystalline particles that are diffusion bonded to each other, and a

neck formed between at least a pair of the single crystalline particles, the neck comprising the same material as the single crystalline particles, as required by claim 16.

Obviousness can be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either explicitly or implicitly in the references themselves or in the knowledge readily available to one of ordinary skill in the art. *In re Kotzab*, 217 F.3d 1365, 1370 55 USPQ2d 1313, 1317 (Fed. Cir. 2000); *In re Jones*, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992); *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988). There is no suggestion in Delnick, Gozdz, Walls et al., and Waterhouse to modify the Delnick and Gozdz batteries so that the porous electron-insulating layer has a porosity of 50% or more and the indefinite-shape particles maintain their shape when subjected to a shearing force to disperse the particles in a liquid component to form a slurry, as required by claim 1; and the porous electron-insulating layer has a porosity of 50% or more and the indefinite-shape particles are polycrystalline particles comprising a plurality of single crystalline particles that are diffusion bonded to each other, and a neck formed between at least a pair of the single crystalline particles, the neck comprising the same material as the single crystalline particles, as required by claim 16.

The only teaching of the claimed secondary batteries is found in Applicants' disclosure. However, the teaching or suggestion to make a claimed combination and the reasonable expectation of success must not be based on applicant's disclosure. *In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991).

The dependent claims are allowable for at least the same reasons as the independent claims from which they depend, and further distinguish the claimed secondary batteries. For example, the cited references do not suggest the indefinite-shape particle comprises a plurality of

primary particles bonded to each other, and the indefinite-shape particle has a mean particle size that is twice or more than the mean particle size of the primary particles and not more than 10 μm, as required by claim 4.

Claim 9 further requires a separator sheet that is interposed between said positive electrode and said negative electrode, said separator sheet being independent of both said positive electrode and said negative electrode. As disclosed in an example in the present specification, a relatively thin separator of 15 μm paired with 5 μm heat-resistant layers (paras. [0072] and [0073]) provides superior performance at low temperature (0 °C) and high discharge rate (2C) (see Table 2). Delnick, on the other hand, disclose examples with much thicker separators. The thickness of Delnick separator (which corresponds to the heat-resistant layer of the present invention) is exemplified as 55 μm, 97 μm, and 77 μm (Examples 1, 2, and 3), which is extremely thick. Further, there is no suggest of the claimed porosity, or any effect of porosity on low-temperature, high-rate discharge in Delnick or Gozdz.

In view of the above amendments and remarks, Applicants submit that this application should be allowed and the case passed to issue. If there are any questions regarding this Amendment or the application in general, a telephone call to the undersigned would be appreciated to expedite the prosecution of the application.

To the extent necessary, a petition for an extension of time under 37 C.F.R. § 1.136 is hereby made. Please charge any shortage in fees due in connection with the filing of this paper, including extension of time fees, to Deposit Account 500417 and please credit any excess fees to such deposit account.

Respectfully submitted,

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